



BIG CHANGES ARE AHEAD IN THE MEMORY CHIP MARKET

Inexorably, the world's leading producers of semiconductors develop a new generation of memory circuits, four times as capacious as previous versions, every two or three years. With each new generation, major computer manufacturers, who rely upon those chips to boost the power and sophistication of their machinery, scramble to assure themselves a plentiful, reasonably priced supply of chips.

This year, as 4-megabit DRAMs (dynamic random access memory chips) enter production, some regional U.S. trading exchanges are proposing a futures market to smooth out price swings for high-tech's hot commodity. More important, three leading computer manufacturers and four major U.S.-owned chipmakers are forming a consortium to produce DRAMs jointly.

While Japanese-owned companies still dominate the open-market for memory chips, especially 1-megabit DRAMs, IBM claims to be the first company to produce 4-megabit DRAMs in volume. It is producing the powerful devices in Burlington (Vermont), Sindelfingen (West Germany), and Yasu (Japan). IBM makes chips only for assembly into its own computers. (*New York Times*, June 23, 1989)

Japanese firms are distributing "sample" 4-megabit DRAMs now, but they are not expected to start mass production until late this year at the earliest. NEC, Japan's largest semiconductor firm, has announced plans to make 4-megabit DRAMs at its Roseville, California (near Sacramento) plant by the spring of 1991. NEC plans to invest \$400 million and hire 400 new workers to expand production. (*San Jose Mercury News*, June 23, 1989)

Meanwhile, the Pacific Stock Exchange in San Francisco and the Twin Cities Board of Trade in Minnesota have announced plans to trade futures contracts on DRAMs. As with other, more traditional commodities—such as pork bellies, grain, etc.—the futures market would allow computer companies and other purchasers of chips to fix their supplies and prices well in advance of their

needs. Presumably, the market would also provide a standard mechanism for unloading surplus chips.

A futures market might serve the needs of small computer companies that need standard DRAMs, but chipmakers point out that not all DRAMs are interchangeable. For example, a Texas Instruments spokesman told the *San Jose Business Journal* (June 5, 1989) that the commodity DRAM market is "giving way to a differentiated memory market." He pointed out that "there are different speeds and different architectures for many types of DRAM chips."

More important, the proposed futures market would do nothing to increase supply, which is really what the computer-makers and other consumers of memory chips want. Though a few small computer firms have invested in minor chipmakers in exchange for an assured supply, calls for a joint venture between chip producers and users have gone unheeded.

Then, this June, seven major U.S. high-tech firms announced plans to start a joint venture, called U.S. Memories, to produce, in volume, state-of-the-art DRAM chips by early 1991. The venture expects to raise \$1 billion in private funds.

Three top computer producers—IBM, Digital Equipment, and Hewlett-Packard—are participating, as are four of the largest U.S. semiconductor firms—Advanced Micro Devices, Intel, LSI Logic, and National Semiconductor. (All four are Fairchild Semiconductor spin-offs based in Silicon Valley.) The two largest U.S.-owned merchant chip producers, Texas Instruments and Motorola (working with Toshiba), already market DRAMs.

It may be some time before the politics of the formation of U.S. Memories are fully known. Why did these seven competitors agree to team up? Will other major U.S.-based high-tech firms, such as AT&T, Sun, and Compaq, join too? How about other chip manufacturers?

One thing is clear, however, U.S. Memories is clearly stamped with the initials IBM. The chief executive and first employee of the consortium is
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Sanford Kane, until now an IBM vice-president. Subject to negotiated details, IBM will provide design and production technology. This could give the firm a head start, since IBM appears to lead the 4-megabit memory race today.

IBM partners in the venture include several of the most technically competent companies and executives in American high-tech industry, so it is unlikely that the "Colossus of Armonk" will be able to use U.S. Memories to absorb or gain control over its competitors.

Rather, it is likely that IBM believes that in the long run it cannot take on its Japanese-owned competitors by itself. Though IBM still dwarfs all major Japanese electronics and computer firms, it respects their ability to enter, compete for, and dominate new markets. It probably fears that collusion by integrated Japanese electronics firms will undermine the thus far dominant U.S.-owned computer industry by reducing the supply or increasing the cost of necessary chips. Such collusion does not directly hurt IBM, but it strengthens its Japanese competition. In launching U.S. Memories, IBM will create an independent supplier while raking in royalties for its technology.

Furthermore, to the degree that U.S. Memories shares its production technology with its chipmaking participants or the Sematech consortium, IBM is solidifying the long-term position of companies that supply it with a variety of other chips, such as Intel's microprocessors. Because DRAMs are usually the first chips to enter mass production at any given feature size, producers have historically used DRAM production to work out bugs in the latest circuit-shrinking technology. Ironically, Silicon Valley chipmakers wanted Sematech to produce chips in volume, but IBM (with Texas Instruments) blocked that proposal.

Though high-tech's supporters in Congress have proposed legislation to exempt production consortia from anti-trust legislation, Kane told the *San Jose Mercury News* (June 22, 1989) that he doesn't anticipate objections to U.S. Memories, even under current legislation. Though participating firms represent a huge chunk of the overall high-tech marketplace, none of them make and sell commodity DRAMs. Thus, the venture will increase, not decrease competition.

It remains to be seen, however, how other computer and semiconductor manufacturers will view U.S. Memories, particularly if technology is transferred directly to participating firms or if it branches out into different product lines.

U.S. Memories is still a concept, not a working corporation. It has one employee, Kane, and no

business plan. It is impossible to assess the validity of its approach until it adopts one. Its formation underscores an important analytic point, however. The best way to describe high-tech competition today is not the U.S. versus Japan, but IBM versus the world.

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CHINA

The turmoil in China is having little direct impact on the global high-tech electronics industry, since the People's Republic is neither an important supplier nor major consumer of computers and chips. U.S. and Japanese firms that have been courting China have a long-term view. Given the age of China's hard-line leaders, current obstacles to cooperation have little impact on their business plans. Furthermore, it is possible that the anti-democratic actions of the Chinese government will improve the commercial environment for outside companies. (The assumption, in the U.S. press, that democracy and capitalism are necessarily linked ignores history.)

More relevant, China's great step backward against free expression is making waves in Hong Kong, the British crown colony scheduled for reversion to China in 1997. Hong Kong is a leading manufacturer and trading center for all types of high-tech devices.

The democracy movement struck a chord in previously apolitical Hong Kong, and the attack on students and their allies generated massive protests there, even from the People's Republic most loyal

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"better late than never"

supporters. Many Hong Kong residents had assumed, prior to recent events, that China would allow business as usual to continue in the colony after reversion. While Hong Kong is by no means democratic, divergent viewpoints are tolerated.

Unless Beijing can find a way to reassure the "Hong Kongese" that business as usual will continue, more of the colony's successful professionals and capitalists are likely to flee. Their cash is already flooding the California real estate market. The Chinese Communist Party leadership must act quickly if it wishes to preserve the technological and other business opportunities that Hong Kong represents, since it is unlikely that the colony's wheelers and dealers will wait until the last minute to decide whether to pursue profit elsewhere.

The upheaval in China also illustrates the power of interactive electronic communications. Though China is still a technologically backward country, many of its graduate students in the U.S. regularly use the most advanced forms of computer technology. As events in China escalated, supporters of the democracy movement here used electronic bulletin boards to update and share the latest news from China. Students here could collate diverse reports from China and send information back in a more coherent form.

However, the electronic reports suffer from the same problem as more traditional forms of communications. Without an identifiable source, it is impossible to check their veracity.

HONG KONG LABOR

Under British rule, industrial policy in Hong Kong is the subject of open debate. The government has turned down the recommendations of a coalition of business organizations. The business groups, including various Chambers of Commerce, manufacturers, and hotel owners, submitted a report to the government, "A Report on Hong Kong's Labour Shortage."

They proposed that 20,000 contract workers from Shenzhen, the adjacent region of China, be imported each day, and that legal Chinese immigration be increased. They fear the impact of spiraling wages in non-manufacturing sectors, particularly business services.

The *Far Eastern Economic Review* (April 27, 1989) notes several objections to the employers report. On the one hand, social critics and unions argue that increased immigration or labor importation would tax the colony's social services housing, and infrastructure. Economists, on the other hand, suggest that Hong Kong follow Taiwan's

approach, upgrading industry and increasing wages.

Presently, industrial wages in Hong Kong are held down by the availability of cheap labor across the border in China. Like American manufacturers in Mexico, Hong Kong employers have shifted labor-intensive operations into China. If China absorbs Hong Kong while permitting continued capitalist industrial growth, that division of labor could continue indefinitely.

MALAYSIAN FLIP-FLOP ON ELECTRONICS UNIONS

The government of Malaysia, the world's largest center for the offshore assembly of integrated circuits, is having second thoughts about allowing unions in the electronics industry. Under pressure from the U.S. AFL-CIO, Malaysia last September announced that it would allow electronics unions for the first time. (See *Global Electronics* No. 88.)

Working with the country's established trade unions, electronics workers quickly began to organize. The *IMF News* (International Metalworkers Federation, Special Edition, 1988), reported, "Several hundred [Malaysian electronics workers] selected a temporary committee for NEW (National Electronics Industry Workers Union)..."

It turns out, however, that in October, 1988, the government severely restricted that policy, announcing that it would only permit in-house, or company unions, not a national organization such as NEW.

The Malaysian-American Electronics Industry (MAEI), representing U.S.-based multinationals with assembly operations in Malaysia, had met with officials, apparently threatening to shift investment elsewhere if genuine labor organization were permitted. MAEI is an association of 16 U.S.-owned firms that employ about 37,000 workers in Malaysia.

In addition, MAEI members and other foreign companies called plant meetings to discourage unionization. The *IMF News* says, "Intel supervisors were told to inform workers that the company would move its operation to Bangkok if a union was formed. Any Intel employee seen visiting the MTUC [Malaysian Trade Union Congress] office in Penang would be dismissed. Intel placed security guards on buses taking workers home to prevent the MTUC from distributing leaflets about the new electronics industry union."

National Semiconductor threatened to dismiss
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and blacklist union members, while Hitachi offered bonuses to workers who signed an anti-union petition. Northern Telecom threatened to move production to China, while Motorola, Bosch, and others likewise discouraged unionization.

SHUTDOWNS IN KOREA

Continued labor militancy in South Korea is undermining the position of U.S.-owned electronics firms that came to the country just for its cheap, historically docile labor. While IBM has settled with its Korean labor union, other U.S. employers have chosen to leave.

In March, Tandy (Radio Shack) closed its operation, laying off 1,400 workers. Fairchild, now owned by National Semiconductor, announced in May that it would close its chip assembly plant and "negotiate a severance package for 271 workers." (*Business Week*, May 15, 1989)

PENTAGON SPECIALIZES IN HDTV DISPLAYS

The Defense Advanced Research Projects Agency (DARPA) has announced the first five contract recipients in its new \$30 million, three-year program to support the development of high definition television (HDTV). While electronics industry trade associations are pushing for a more substantial U.S. government commitment to all forms of HDTV technology, including broadcast and reception (see *Global Electronics* No. 92), DARPA has apparently decided to focus its funding on a subject of particular interest to the armed services, high quality displays.

Four of the first five contracts are to develop projection television systems. The contractors are Newco, which is working with Spectra-Physics, Raychem, which is teamed with Xerox, Texas Instruments, and Projectavision.

The fifth contractor, Photonics Technology, is to develop a flat panel screen. All five companies still have to negotiate the amounts and other details of their contracts. (*San Jose Mercury News*, June 14, 1989)

CANON IS NEXT

In a deal that typifies the growing interdependence of U.S.-based and Japanese electronics firms, Japan's Canon has purchased one-sixth of Next Inc., the latest venture of Apple Computer-founder Steve Jobs. This June Canon invested \$100 million, and it obtained rights to be sole distributor of Next computers in Japan and eight other Asian countries.

Next, an innovative Silicon Valley producer of work stations, has yet to establish itself in the marketplace, but with Jobs at the helm it has attracted enormous publicity. The Canon investment reduces Jobs' personal holdings to half of Next. Other major stockholders are H. Ross Perot (the outspoken founder of Electronic Data Systems), with 12.51%, and Next employees, with 20%. (*San Jose Mercury News*, June 13, 1989)

Canon has worked closely with Next since the beginning. It supplies the optical disk drives that serve as mass memory for the Next boxes, and it supplies key components for Next laser printers. (Canon has also supplied "engines" to Hewlett-Packard and Apple Computer for their popular LaserJet and LaserWriter printers.)

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